Attorney Docket No. 2001P11003WOUS

CERTIFICATION OF ATTACHED ENGLISH TRANSLATION OF GERMAN APPLICATION DE 101 29 570.7 Filed 06/20/2001

I hereby certify the English translation attached is a true and accurate copy of the referenced DE 101 29 570.7 application.

Russell W. Warnock
March 16, 2005
Registration No. 32,860

ZTP01P11003

Apparatus for loading and/or unloading a transport compartment

The invention is based on an apparatus for loading and/or unloading a transport compartment according to the preamble of claim 1.

Apparatuses of the generic type for loading and unloading transport compartments of commercial motor vehicles, using conveyor belts, are known. The apparatuses have a first conveyor belt installed in a loading region and a second conveyor belt installed in the transport compartment. In order to load a transport compartment, a plurality of goods units to be transported is placed on the conveyor belt installed in the loading region. The conveyor belts in the loading region and transport compartment are then driven synchronously and the goods units are conveyed into the transport compartment.

The object of the invention is, in particular, to provide an inexpensive apparatus of the generic type which can be used flexibly and is efficient. According to the invention, the object is achieved by the features of patent claim 1, while advantageous refinements and developments of the invention can be taken from the subclaims.

The invention is based on an apparatus for loading and/or unloading a transport compartment, in particular of commercial motor vehicles, with at least one conveying unit via which in particular a plurality of goods units can be conveyed simultaneously.

It is proposed that the conveying unit be capable of being inserted at least partly into the transport compartment. The

transport compartment can be loaded and/or unloaded completely with a large number of goods units in a few operations, preferably in one operation, in a short time. Waiting times in loading regions can be reduced, and the level of utilization of commercial vehicles can be increased and, in particular, costly re-equipment of transport compartments with additional special apparatuses can be avoided. Furthermore, advantageous loading and/or unloading of numerous different standard transport compartments and, as a result, particularly flexible use is achieved. The apparatus according to the invention can be used in different areas of application appearing expedient to those skilled in the art, such as when loading and unloading rail containers, ship's containers and so on, but in particular when loading and unloading commercial motor vehicle transport compartments, which can frequently be loaded only in their longitudinal direction.

The conveying unit can be constructed as a freely movable unit which has its own drive or can be moved manually or via a separate conveying means, for example by a lift truck and so on. However, the conveying unit is particularly advantageously installed in a loading region. Simple control of the conveying unit can be achieved and, in particular, existing buildings in the loading region can be used to store parts of the conveying unit, for example to store a guide and/or support unit, a drive unit and so on.

If the conveying unit has at least one gripping unit and at least one lifting unit, by which the goods units can be lifted off their base, the goods units can be conveyed into and out of the transport compartment, irrespective of floor conditions and possibly without a ramp. Flexible handling can be achieved. The gripping unit can be implemented in various ways appearing expedient to those skilled in the art, for

example, via the gripping unit, a force-fitting and/or form-fitting connection with the goods units can be produced, and in this case the gripping unit can be driven electrically, hydraulically, pneumatically and/or manually. If the gripping unit is designed as a clamping unit, various goods units can be gripped simply without the latter having to be designed accordingly with holding elements.

It is conceivable that, using a single gripping unit in the loading/unloading direction, a plurality of goods units, possibly stacked, can be picked up by a single gripping unit. However, if at least two gripping units are provided one after the other in the loading/unloading direction, the goods units can be gripped particularly exactly and securely, specifically in particular if a gripping unit is provided for each goods unit in the loading/unloading direction or for each transverse row. Furthermore, small gripping units can be implemented which, for example, in the event of damage or in order to adapt to changing boundary conditions, such as transport compartments of different lengths, can be replaced, added and/or removed flexibly.

In a further refinement of the invention, it is proposed that the gripping unit be operatively connected to a guide and/or support unit which belongs to the conveying unit and can be inserted into the transport compartment, which means that advantageous guidance and positioning of the goods units can be achieved. The guide and/or support unit can be formed of various components or subassemblies appearing expedient to those skilled in the art, such as a guide frame and so on. However, the guide and/or support unit is particularly preferably formed by one or more beams, for example with a double T section, by which means a particularly space-saving construction can be implemented. If the guide unit is

designed in one piece with a support unit, additional components, installation space, installation effort and costs can be saved.

If the guide and/or support unit is arranged above a holding region of the gripping unit, an advantageously narrow construction can be achieved, specifically in that lateral support and/or guide parts can be avoided. The guide and/or support unit can in this case be mounted in a frame or advantageously in a building ceiling which is frequently already present, for example of a storage building, by which means again additional components and installation space can be saved. In principle, however, the guide and/or support unit can also be arranged at the side of a pick-up region of the gripping unit.

Furthermore, it is proposed that the gripping unit be mounted such that it can be displaced on the guide and/or support unit, for example via antifriction bearings or sliding bearings. Loading by the weight of the goods units during the insertion of the guide and/or support unit into the transport compartment can be avoided, and inexpensive mounting of the guide and/or support unit can be implemented. Furthermore, on the guide and/or support unit, at its end pointing in the direction of the transport compartment, a supporting element can advantageously be provided, for example a supporting foot which can be extended telescopically and which can be extended following the insertion of the guide and/or support unit into the transport compartment and before the conveyance of the goods units. Large moments acting on the guide and/or support unit on account of long lever arms can be avoided, and an inexpensive construction can be achieved.

If the gripping unit has at least a second degree of freedom of movement in addition to a first degree of freedom of movement, the apparatus can be matched flexibly to a position of the transport compartment and/or to a position of the goods units provided. The gripping unit can be designed such that it can be pivoted about one or more axes and moved translationally in one or more directions. Here, the gripping unit can be designed to be mounted appropriately on the guide and/or support unit and/or the guide and/or support unit can be designed to be mounted appropriately. If the gripping unit can be moved transversely over a crossmember, a number of goods units provided transversely with respect to the loading/unloading direction can in particular be gripped simply and conveyed. Corresponding crossmembers can be implemented particularly simply if the guide and/or support unit is mounted on a building ceiling. Instead of a crossmember, it is in principle also conceivable to design a floor element of a loading region to be moved in various directions in order to bring goods units into a gripping region of the conveying unit.

The gripping unit can be designed such that it can be driven about various axes and in various directions and/or mounted such that it can advantageously be moved freely or floating, at least with respect to one degree of freedom of movement, during the loading and/or unloading operation, so that said gripping unit can automatically adapt, at least to a limited extent, to a position of the transport compartment and also to a position of the goods units provided. In order to achieve the situation where the gripping unit is freely movable with regard to at least one degree of freedom of movement, it can be expedient to decouple the gripping unit at least partly from a drive unit which could hamper free movement as a result of resistance forces.

If at least one goods unit can be supported by supporting rollers, specifically in particular on a floor of the transport compartment and/or on a floor of the loading region, complicated mounting of a support unit can be avoided. The support unit can be assisted or completely replaced in its function by the supporting rollers. Instead of supporting rollers, anti-bending units are also conceivable, for example having a plunger which acts on the support unit and is driven hydraulically, pneumatically and/or electrically. Anti-bending units are known in particular from the calendering engineering sector.

Further advantages emerge from the following drawing description. Exemplary embodiments of the invention are illustrated in the drawing. The drawing, the description and the claims contain numerous features in combination. Those skilled in the art will also expediently consider the features individually and combine them to form expedient further combinations.

Fig. 1 shows a schematically illustrated apparatus according to the invention during a loading operation before the insertion of a support beam into a transport compartment,

Fig. 2 shows the apparatus from Fig. 1 following the insertion of the support beam into the transport compartment,

Fig. 3 shows the apparatus from Fig. 2 after the loading operation,

Fig. 4 shows the apparatus from Fig. 1 in a schematic front view before a lifting operation,

Fig. 5 shows the apparatus from fig 4 after the lifting operation,

Fig. 6 shows the apparatus from Fig. 1 in a front view when gripping new goods units,

Fig. 7 shows an illustration from above of an alternative apparatus to Fig. 1 with supporting rollers,

Fig. 8 shows a section along the line VIII - VIII in Fig. 7 before a lifting operation,

Fig. 9 shows a section along the line VIII - VIII in Fig. 7 after a lifting operation,

Fig. 10 shows an illustration of an alternative apparatus to Fig. 1 with a separately insertable support beam before a loading operation,

Fig. 11 shows the apparatus from Fig. 10 following the insertion of the support beam into a transport compartment,

Fig. 12 shows the apparatus from Fig. 11 with the supporting foot extended,

Fig. 13 shows the apparatus from Fig. 12 after the loading operation and

Fig. 14 shows an illustration of an alternative apparatus to Fig. 7 with a freely movable conveying unit.

Fig. 1 shows a schematically illustrated apparatus for loading and unloading transport compartments 10, specifically commercial motor vehicles 11. The apparatus comprises a

conveying unit 13 which is installed in a loading region 12 and by which a plurality of goods units 16 can be conveyed simultaneously from the unloading region 12 into the transport compartment 10.

The conveying unit 13 has a support beam 20 which is mounted via a guide unit 32 and via crossmembers 27 on a building ceiling 23 of a storage building, not specifically illustrated, and which has a double T section, on which ten clamping units 17 are fixed one after another in the loading/unloading direction 19. The support beam 20 is arranged above a holding region 22 of the clamping units 17. The clamping units 17 have two substantially vertically aligned legs 28, 29 and a crossbeam 30, on which the legs 28, 29 are mounted such that they can be moved toward each other and driven hydraulically (Figs 4 and 5).

The crossbeam 30 is connected to the support beam 20 via a hydraulic reciprocating cylinder 31 which forms a lifting unit 18, by which the goods units 16 in the clamping units 17 can be lifted off their base. It is also possible to provide a lifting unit between the legs 28, 29 or to design the support beam 20 such that it can be lifted by a central lifting unit.

In order to load the transport compartment 10, goods units 16 provided with the clamping units 17, arranged beside one another in three rows and stacked threefold above one another are traveled over. In the process, the support beam 20 with the guide unit 32 is moved in the crossmembers 27 fixed to the building ceiling 23, transversely with respect to the loading/unloading direction 19, in front of or behind the goods units 16 provided, and then moved over the goods units 16 in the longitudinal direction in the guide unit 32 (Fig. 6). Given sufficiently high buildings, it would also be

conceivable for the clamping units 17 to be raised by a lifting unit until the clamping units 17 can be moved transversely over the goods units 16 provided.

Once the legs 28, 29 of the clamping units 17, come to lie in their desired position laterally beside the goods units 16, the goods units 16 are gripped by the clamping units 17, to be specific, preferably nine goods units 16 or one transverse row of goods units 16 per clamping unit 17 or, in the case of an overlapping gripping technique, eighteen goods units 16.

Once the goods units 16 are fixed securely in the clamping units 17, they are respectively lifted off their base by the reciprocating cylinders 31 of the lifting unit 18. Then, the support beam 20 with the clamping units 17 and the goods units 16 secured therein are introduced into the transport compartment 10 (Fig. 2). The support beam 20 is displaced in the longitudinal direction in the guide unit 32. In order to achieve a situation where the conveying unit 13 can match the position of the transport compartment 10, the support beam 20 can move freely in the transverse direction in the crossmembers 27 during the insertion into the transport compartment 10. In order to compensate for an angular offset, it is also conceivable to design the support beam 20 such that it can be pivoted about a vertical and/or horizontal axis.

After the goods units 16 have been inserted into the transport compartment 10, the goods units 16 are set down on a floor of the transport compartment 10 by the lifting unit 18, and the clamping units 17 are opened. The support beam 20 with the clamping units 17 is then guided out of the transport compartment 10 (Fig. 3).

During an unloading operation of the transport compartment 10, not specifically illustrated, the support beam 20 with the empty clamping units 17 is guided over the goods units 16 in the transport compartment 10, the clamping units 17 are closed, the goods unit 16 are lifted by the lifting unit 18 and then the support beam 20 with the clamping units 17 and the goods units 16 fixed therein is conveyed out of the transport compartment 10.

A first alternative apparatus is illustrated in figs 7 to 9, a second alternative apparatus is illustrated in figs 10 to 13, and a third alternative apparatus is illustrated in Fig. 14. Substantially constant components are in principle numbered with the same reference symbols. Furthermore, with regard to constant features and functions, reference can be made to the description of the exemplary embodiment in figs 1 to 6. The following description is essentially restricted to the differences with respect to the exemplary embodiment in figs 1 to 6.

The apparatus in figs 7 to 9 has a conveying unit 14 in which supporting rollers 24 are fixed to a support beam 20 by U-shaped frames. Goods units 16 to be transported can be supported on a floor of a loading region 12 and on a floor of a transport compartment 10 by clamping units 17, the support beam 20, the U-shaped frames and by the supporting rollers 24. The support beam 20 is assisted in its supporting function by the supporting rollers 24 and is used substantially for lateral guidance. In order to achieve the situation where the clamping units 17 with the goods units 16 can follow a floor inclination, in particular in the transport compartment 10, the support beam 20 is mounted such that it can move freely in the vertical direction.

The apparatus in Figs 10 to 13 has a conveying unit 15 in which clamping units 17 are mounted such that they can be displaced on a support beam 21, to be specific via antifriction bearings not specifically illustrated. In order to load a transport compartment 10, firstly the support beam 21 is inserted into the transport compartment 10 without the clamping units 17. Fixed to the support beam 21, at its end 25 pointing in the direction of the transport compartment 10, is a supporting element 26 which is formed by a telescopic supporting foot 33 which can be extended hydraulically.

Once the support beam 21 has been inserted completely into the transport compartment 10 (Fig. 11), the supporting foot 33 is extended (Fig. 12). Then, the clamping units 17 with the goods units 16 secured in the latter and lifted by a lifting unit 18 are conveyed into the transport compartment 10 in a suspended manner along the support beam 21 (Fig. 13).

After the goods units and 16 have been set down by the lifting unit 18, the clamping units 17 have been opened and the supporting foot 33 has been retracted again, the support beam 21 together with the clamping units 17 is guided out of the transport compartment 10.

The apparatus in Fig. 14 has a freely movable conveying unit 34, in which supporting rollers 24 are fixed to a support unit 35 via U-shaped frames. Goods units 16 to be transported can be supported on a floor of a loading region 12 and on the floor of a transport compartment via clamping units 17, the support unit 35, the U-shaped frames and via the supporting rollers 24. The conveying unit 34 can be driven via an integrated motor, not specifically illustrated, and can be controlled by radio. In principle, however, it would also be

conceivable for the conveying unit 34 to be moved by a lift truck or manually.

Reference symbols

10 Transport compartment
11 Commercial motor vehicle
12 Loading region
13 Conveying unit
14 Conveying unit
15 Conveying unit
16 Goods unit
17 Gripping unit
18 Lifting unit
19 Loading/unloading direction
20 ~~Guide and/or support unit~~ Support beam ✓
21 ~~Guide and/or support unit~~ " " ✓
22 Pick-up region
23 Building ceiling
24 Supporting roller
25 End
26 Supporting element
27 Crossmember
28 Leg
29 Leg
30 Crossbeam
31 Reciprocating cylinder
32 Guiding unit
33 Supporting foot
34 Conveying unit
35 Guide and/or support unit